Computer Assignment 1: MATLAB

Introduction

This file will show the code and results for the first computer assignment for ECE132A. The code and results are each shown in their own sections below.

MATLAB Code

The MATLAB code used to solve problem 2.10-1 is shown below. The code is annotated so that we can see which part of the code is responsible for each part of the question.

```
%% ECE132A: Computer Assignment 1
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%Date: 4/7/2020

%% 2.10-1
clc,clear;
%variables used for generating our signals
dt =0.00001;
M=3;

%% Part A:
T=2*pi; %set period
time_a =[(-T/2):dt:(T/2)];%generate time
f_a = zeros(1,length(time_a));
for i =1:length(f_a)
    if(time_a(i) >0)
        f_a(i) = exp(-time_a(i)/10);
    else
        f_a(i) = -exp(-(time_a(i)+pi)/10);
    end
end
power_a = periodic_power(f_a, T,dt, M);
%% Part B:
T =4;
time_b = [-T/2:dt:T/2];%generate time
f_b = time_b.^3;
power_b = periodic_power(f_b,T,dt,M);
%% Part C:
x_c =f_a;
for i=1:length(x_c)
    x_c(i) = x_c(i)*2*cos(10*time_a(i));
end
T = 2*pi;
power_c = periodic_power(x_c,T,dt,M);
%% Part D:
x_d =f_b;
for i=1:length(x_d)
    x_d(i) = -x_d(i)*cos(5*pi*time_a(i));
end
```

```
T=4;
power_d = periodic_power(x_d,T,dt,M);

%generate some plots
figure(1);
subplot(2,2,1);
plot(time_a, f_a);
xlabel("t");
title("A");
subplot(2,2,2);
plot(time_b, f_b);
xlabel('t');
title('B');
subplot(2,2,3);
plot(time_a, x_c);
xlabel('t');
title('C');
subplot(2,2,4);
plot(time_b, x_d);
xlabel('t');
title('D');
saveas(1,"signal_plots.jpg");

fprintf("power of A: %f\n", power_a);
fprintf("power of B: %f\n", power_b);
fprintf("power of C: %f\n", power_c);
fprintf("power of D: %f\n", power_d);


function [power] = periodic_power(signal, period,dt, M_periods)
t = [-period/2:dt:period/2];
time=[];
y_periodic =[];
for i =-M_periods:M_periods-1
    time = [time i*period + t]; %#ok<AGROW>
    y_periodic = [y_periodic signal]; %#ok<AGROW>
end
power = sum(y_periodic*y_periodic')*dt/(max(time)-min(time));
end
```

Results

The output of our MATLAB file is shown here. The results show that we are able to calculate the average power of each of the periodic signals that are given for the problem. We see the results of each of the questions in the lines below. Also note that plots of each of the signals is shown in Figure 1. Each signal is labeled by the part that is corresponds to.

power of A: 0.742477

power of B: 9.143017

power of C: 1.485105

power of D: 4.558855

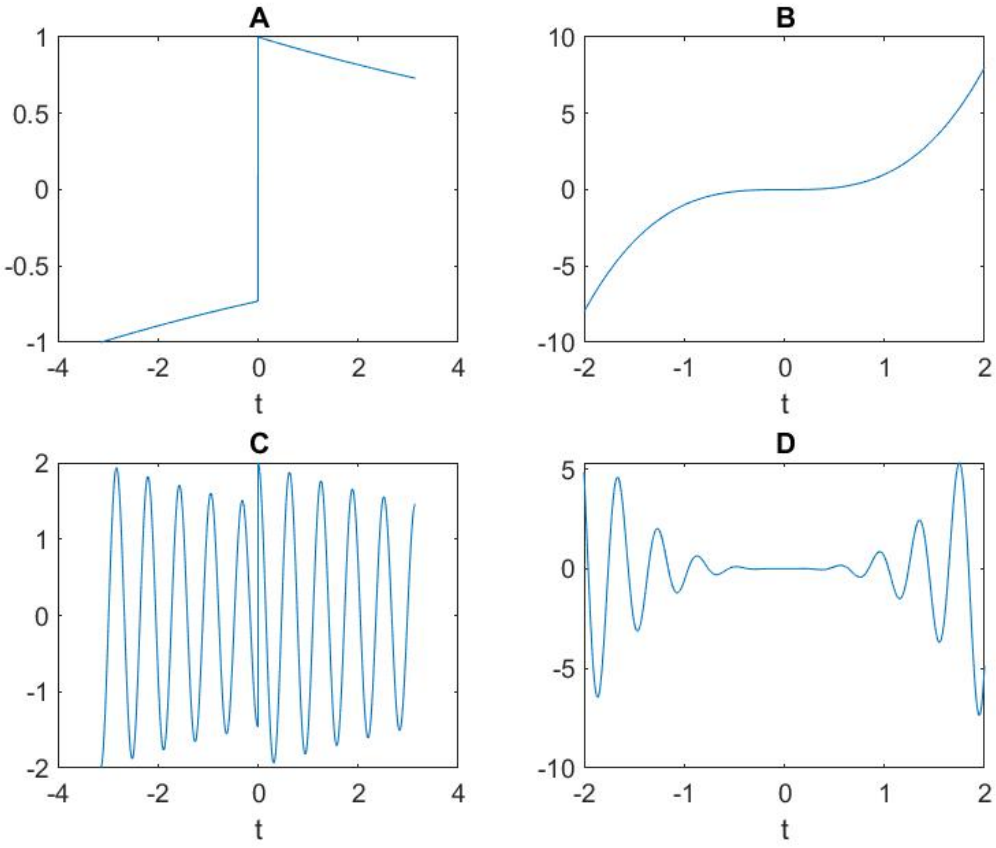

Figure 1: Plots